No specific bean sheet -
Was sent to George LaRocca
3-30-93

Revised Ecological Effects Branch Review

Lamda-cyhalothrin

100.0 Submission Purpose and Label Information

100.1 Submission Purpose and Pesticide Use

ICI Americas has applied for full section 3 registration for lamda-cyhalothrin, which is also referred to as Karate or PP321. Lamda-cyhalothrin is a synthetic pyrethroid that may be used for the control of a variety of insects on cotton by contact action.

100.2 Formulation Information

ACTIVE INGREDIENT: (+)-alpha-cyano-(3-phenoxyphenyl)methyl(±)-cis-3-(Z-2-chloro-3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropanecarboxylate	13.1%
INERT INGREDIENTS:	86.9%
TOTAL .	100.0%

Lamda cyhalothrin contains 1 pound of active ingredient per gallon(1 lb ai/gal).

100.3 Application Methods, Directions, Rates

See Attachment A for the application methods and label directions.

100.4 Target Organisms

Lamda-cyhalothrin is expected to control a wide variety of insect pests on cotton, which include the following: thrips (tobacco and soybean), lygus bugs, pink bollworm, cabbage looper, cotton leafperforator, cutworm, saltmarsh caterpillar, cotton fleahopper, cotton bollworm, tobacco budworm, boll weevil, fall armyworm, and beet armyworm.

100.5 Precautionary Labeling

ENVIRONMENTAL HAZARDS: This pesticide is extremely toxic to fish and aquatic invertebrates. Do not apply directly to water or areas where surface water is present, or to intertidal areas below the mean high water mark. Do not apply when weather conditions favor drift from treated areas. Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwaters.

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

101.0 Hazard Assessment

101.1 Discussion

According to the 1991 Agricultural Statistics, a total of 12,196,800 acres were grown in 1990 amongst the following states: Alabama, Arizona, Arkansas,California, Florida, Georgia, Kansas, Louisiana, Mississippi, Missouri,New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia. Specifically, California, Mississippi, and Texas grew approximately 7,895,000 acres or 64 % of the total U.S. acres.

Cotton belongs to the mallow family and requires a long, frost-free season. Typically, cotton is grown in areas where the mean temperature of the summer months is greater than 77^{0}F. Planting starts as early as February in Texas, and moves north across the cotton belt as the season advances. The bulk of the U.S. crop is planted during April but may not be completed until mid-June, depending on the region. Most of the U.S. crop is harvested in October and November except in the Plains areas of Texas, which may be as late as December. The typical growing season is 175 days. The plant is herbaceous with a long tap root and attains a height of 2 to 5 or more feet. Most of the cotton grown in the United States is upland cotton with a staple length (fibers) of 1 inch or longer. Some extra-long staple 1 1/2 inches long cotton are grown in Texas, New Mexico, Arizona, and California.

Lamda cyhalothrin is a synthetic pyrethroid which is currently conditionally registered for cotton. This pesticide may be sprayed as early as 7 days after planting in order to control pests such as fall and beet armyworm and the cabbage and soybean loopers. Lamda-cyhalothrin is expected to be applied as early as 21 and 45 days after planting to control the bollworm and the boll weevil, respectively. Application is more likely to start in late June.

According to Biological and Economic Analysis Division, 42 % of the cotton market is treated with synthetic pyrethroids, with a potential of 4 million acres are treated with an average of 3.3 times during the growing season. The label allows up to 0.2 lb a.i./A per season, with a possible 10 applications. The pesticide may be applied every 3 to 5 days for boll weevil control.

101.2 Likelihood of Adverse Effects to Nontarget Organisms

Terrestrial Organisms Toxicity

Toxicity to Avian Species

The available data indicate technical grade lamda cyhalothrin is practically nontoxic to waterfowl on an acute oral basis (mallard LD_{50} > 3950 mg/kg).

Technical grade lamda cyhalothrin is practically nontoxic to upland game birds and slightly toxic to waterfowl on a subacute dietary basis (bobwhite LC_{50} > 5300 ppm, mallard LC_{50} = 3948 ppm).

Cyhalothrin, the parent compound, consists of two pairs of isomers. One of the two pairs is lamda cyhalothrin, which is the biologically active isomer. One supplemental mallard duck reproduction study conducted on cyhalothrin indicated the NOEL = 5 ppm and LOEL = 50 ppm for eggs laid. Another mallard reproduction study was submitted which was conducted on the lamda cyhalothrin (the biologically active isomer) and was classified as core. Based on the results from this study, the NOEL for reproductive effects to the mallard duck is was 30 ppm. A LOEL was not ascertained since 30 ppm was the highest dose tested. There was an increase in "old yolk peritonitis" at the 5 ppm dose. The residues were also measured in the egg and the fat and liver of the bird. The results are as follows: residues in the egg were significantly greater at 15 ppm treatment level and residues were significantly greater in the fat at the 30 ppm treatment level. Residues in the liver were not significantly different at all doses tested(NOEL= 30ppm).

An acceptable bobwhite quail reproduction study on cyhalothrin indicated the NOEL = 50 ppm for eggs laid, eggs set, viable embryos, live embryos, normal hatchlings, and 14-day survivors at 50 ppm cyhalothrin. The statistical analysis indicated the NOEL = 50 ppm for eggs cracked as well. However, there was a high percent eggs cracked (17 percent) in the control.

Mammalian Toxicity

Lamda cyhalothrin is moderately toxic to mammals on an acute oral basis (rat LD_{50} values ranging from 56 to 79 mg/kg). A 90-day rat feeding study indicated a NOEL of 50 ppm and a LOEL of 250 ppm. A chronic dog feeding study indicated a NOEL of 0.5 mg/kg/day. The LOEL was 3.5 mg/kg/day. Teratogenicity studies on cyhalothrin indicate NOELs for the rat and rabbit of 10 mg/kg/day.

Honey Bee Toxicity

Technical lamda cyhalothrin is highly toxic to honey bees with a reported contact LD_{50} of 0.038 ug/bee and an oral LD_{50} = 0.909 ug/bee. Formulated product (5.04% ai) is also highly toxic to honey bees with a reported contact LD_{50} = 0.098 ug/bee and a oral LD_{50} = 0.483 ug/bee. The LT_{50} (age of residue lethal to 50% of the bees) of the 0.013 lb ai/A was between 4 and 12 hours, and about 23 hours at 0.03 lb ai/A. On this basis, lamda cyhalothrin is considered highly toxic to honey bees as a foliar residue.

A honey bee field repellency and toxicity study indicated lamda cyhalothrin was moderate with regard to bee repellency. Another honey bee foraging study conducted on simulated honey dew on winter wheat indicated that inhibition of foraging by lamda cyhalothrin was detectable up to 3 days, but was strongly marked in the first 24 hours. Lamda cyhalothrin at 7.5 and 15 g ai per ha on cereals where there is honey dew (the substance bees collect from flowers) should present no appreciable hazard to honey bees.

Aquatic Organism Toxicity

Acute - Freshwater Organisms

Lamda cyhalothrin is very highly toxic to both warmwater and coldwater fish (bluegill LC_{50} = 0.21 ug/L and rainbow trout LC_{50} = 0.24 ug/L). This chemical is very highly toxic to freshwater invertebrates as well, with a reported Daphnia magna LC_{50} = 0.36 ug/L and Gammarus pulex LC_{50}s = 6.68 ng/L, 9.13 ng/L.

Chronic - Freshwater Organisms

A supplemental study conducted on Daphnia magna exposed to lamda cyhalothrin indicated the number of young and the number female reproductive days were affected at levels as low as 18.3 ng/L with the NOEL = 8.5 ng/L. A NOEL = 18.3 ng/L was indicated for the growth of the Daphnia magna and a LOEL = 37.2 ng/L. The study has major discrepancies that deviate from current methodology. Adult survival could not be accurately ascertained.

Another supplemental Daphnia magna life cycle study was conducted on lamda cyhalothrin. Based on the results of the study, both the number of young per female and adult survival were the most sensitive with a NOEL of 1.98 pptr and a LOEL of 3.5 pptr.

A supplemental fish full life cycle study was conducted on the fathead minnow. Based on the results of the study, the following parameters were the most sensitive with a NOEL of 31 pptr and a LOEL of 62 pptr: F1 Survival at 28 days; F0 length at

56 days; F0 Male length and weight at 300 days, and F1 weight and length at 31 days.

Formulated Product

Formulation testing with 12.92% lamda cyhalothrin ai indicates the formulated product is also very highly toxic to fish and invertebrates, with LC_{50} values ranging from 0.09 to 3.4 ug/L. Lamda cyhalothrin is formulated with inerts that cause concern for toxicity to aquatic organisms.

Acute - Marine/Estuarine Organisms

The available estuarine data indicate that technical lamda cyhalothrin is very highly toxic to the sheepshead minnow, with an LC_{50} value of 0.807 ug/L. An embryolarvae study on the Pacific oyster indicated technical lamda cyhalothrin is highly toxic to marine invertebrates, with an EC_{50} > 0.59 mg/L. A mysid acute toxicity study indicated the lamda cyhalothrin is very highly toxic to mysid shrimp with an LC_{50} = 4.9 ng/L.

Chronic - Marine/Estuarine Organisms

A fish early life stage study was conducted on sheepshead minnow exposed to lamda cyhalothrin. This scientifically sound study, which was classified as "Core," indicated that the weight of Cyprinodon variegatus is affected at levels as low as 0.38 ug/L and the NOEL = 0.25 ug/L. The percent survival of embryos, larval survival from hatch and larval survival from initial indicated a NOEL = 0.38 ug/L. Length also indicated a NOEL= 0.38 ug/L.

An acceptable life cycle study was conducted on Mysidopsis bahia, mysid shrimp, exposed to lamda cyhalothrin. The study results indicate that the NOEL = 1.7 ng/L for both survival and dry weights. The number of offspring(reproductive success) was determined to have a NOEL = 0.22 ng/L and a LOEL = 0.46 ng/L.

Environmental Fate

Limited environmental fate data were available to EEB. Lamda cyhalothrin dissipated with a half-life of 14 to 28 days in sandy loam soils in North Carolina and California and 28 to 60 days in silt loam soil in Mississippi and silty clay loam soils in Illinois. It should be noted that no analysis was made for degradation products.

Cyclopropane-labeled ^{14}C-Cyhalothrin (99.5% pure) of which lamda cyhalothrin is a constituent was immobile on loamy sand, clay loam, and sandy loam soil TLC plates; 60 to 90 percent of the recovered remained within 1 cm of the treated area.

An acceptable bioaccumulation study on carp exposed to radiolabeled cyhalothrin is reported to have a bioconcentration factor at least 4600 in total fish (Art Schlosser, EAB, personal communication, March 3, 1988). The water solubility is reported to be 4 ppb.

Radiolabeled lamda cyhalothrin, at 0.46 ug ai/g, degraded with a half-life of < 30 days in sandy loam soil moistened to 40 percent of the moisture-holding capacity at zero suction and incubated at 20 'C (EAB review, April 11, 1986).

According to David Jones(EFGWB, personal communications 2/16/93), the foliar half-life for lamda cyhalothrin is estimated to be 5.3 days.

Mesocosm Results

EEB concluded there was a reduction in biomass ranging from 21 to 29% depending on the treatment level and if it was total fish or macroinvertebrates and zooplankton at all or some of the treatment levels. Since there were significant effects at all doses tested when compared to the control, a NOEL was not determined for total biomass, growth rate, or size distribution. In addition, a NOEL was not determined for various other aquatic populations.

Some specific adverse effects to fish are as follows: total biomass was significantly reduced in the treated ponds when compared to the control ponds; statistically significant differences in the biomass of the 2, 4, 5, and 6 cm size classes; and the number of fish were significantly reduced in the treated ponds(fish greater than 3 cm size classes) when compared to the control ponds.

Terrestrial Residues

On the currently submitted label, lamda cyhalothrin can be applied at a maximum rate of 0.04 lb ai/A as often as every 3 to 5 days. Using EEB's nomograph (Urban, D. and N. Cook, Ecological Risk Assessment, EPA-540/9-85-001), the following terrestrial residues are expected based on a single application rate of 0.04 lb ai/A:

Substrate	Residues (ppm)
Short rangegrass	9.6
Long grass	4.4
Leaves and leafy crops	5.0
Forage (alfalfa and clover)	2.32
Fruit	.28
Soil (top 0.1 inch)	0.88
Top 6 inches of water (direct application ppb)	29.4

Aquatic Residues

Ron Parker, EFGWB, completed the aquatic exposure assessment by implementing environmental fate and transport computer models in use by EFGWB. This analysis uses the Pesticide Root Zone Model (PRZM1) to simulate pesticides in field runoff and the Exposure Analysis Modeling System (EXAMS) to simulate pesticide fate and transport in an aquatic environment.

Basic data on soils, methods of cotton culture and regimes of pesticide application have been provided by the Agricultural Research Service (ARS) and Soil Conservation Service (SCS) of USDA in Mississippi and by the Yazoo county extension office.

The one hectare by two meter pond which receives runoff from the ten hectare field has the characteristics of the Georgia pond which is provided with the EXAMS program. The simulation is carried out for pH value of 7.0. Five spray drift loadings, each amounting to five percent of the application rate, are simulated in the EXAMS program along with the individual runoff events.

Based on the above information the estimated environmental concentration(EEC) was calculated and the results are as follows:

Instantaneous= 100.2 pptr

48 hour = 40.47 pptr

21 day = 14.0 pptr

60 day = 3.8 pptr

90 day = 2.98 pptr

Risk Assessment

A. Effects on Terrestrial Organisms

Avian

Gulls and terns have been found to eat insects in cotton fields (Ann Stavola 1988). Other avian species such as doves, ring-necked pheasant, songbirds, and greater prairie chicken are found in cotton fields for feeding, loafing, cover, and broodrearing. Geese and ducks are reported to incidentally visit cotton fields in Oklahoma throughout the year (Gusey, W. F. and Z. Maturgo 1973).

Lamda cyhalothrin is practically nontoxic to waterfowl on an acute oral basis. The chemical is practically nontoxic to upland game birds and slightly toxic to waterfowl on a subacute dietary basis. Based on the acute toxicity data, it appears that neither the restricted use nor the endangered species triggers are exceeded.

Results from a bobwhite reproduction study indicated that eggs laid, eggs set, eggs cracked, viable embryos, live embryos, normal hatchlings, and 14 day old survivors were not effected at levels up to 50 ppm.

The submitted reproduction data on the mallard exposed to cyhalothrin showed adverse effects on number of eggs laid at levels of 50 ppm cyhalothrin, with the NOEL= 5 ppm cyhalothrin. Another mallard study indicates that the NOEL for reproductive effects to the mallard duck was 30 ppm. A LOEL was not ascertained since 30 ppm was the highest dose tested. However, there was an increase in "old yolk peritonitis" at the 5 ppm dose. The residues were also measured in the egg and the fat and liver of the bird. The results indicate that residues in egg significantly increased at 15 ppm (LOEL) when compared to the control.

Since the estimated terrestrial exposure of lamda cyhalothrin on short range grass is expected to be 9.6 ppm, the LOEL is not expected to be exceeded. Therefore, based on available information, EEB does not expect acute or chronic adverse effects to avian species from exposure to lamda cyhalothrin.

Mammalian

The exposure is expected to be well below the NOEL of 50 ppm reported for the rat 90-day chronic feeding study. Therefore, there is no concern for mammalian species.

Bees

This chemical is highly toxic to bees when they are exposed to direct application at normal use rates. Lamda cyhalothrin is highly toxic to honey bees as a foliar residue, when bees are caged on treated foliage. Lamda cyhalothrin is a moderate repellant to honey bees in the field; thus, significantly reducing residual toxicity hazard.

B. Effects on Aquatic Organisms

Since cotton is a use site associated to some extent with estuarine or marine habitat (Maciorowski 1993), both freshwater and marine data were considered to determine the effects to aquatic nontarget organisms.

Lamda cyhalothrin is very highly toxic to freshwater and marine/estuarine fish. The EEC of 100.2 pptr clearly exceeds the triggers for restricted use classification (1/10 LC_{50} with values as low as 21 pptr) and endangered species (1/20 LC_{50} with values as low as 10 pptr) for freshwater fish.

Lamda cyhalothrin is very highly toxic to freshwater and marine/estuarine invertebrates.The EEC of 100.2 pptr clearly exceeds the triggers for restricted use classification (1/10 LC_{50} with values as low as 0.49 pptr) and endangered species (1/20 LC_{50} with values as low as 0.245 pptr) for aquatic invertebrates.

The EEC of 100.2 pptr exceeds 1/2 the LC50 for Gammarus pulex and mysid (shrimp). One half the LC50 is the level of concern which, if exceeded, indicates the potential for serious acute effects. Such effects are anticipated for estuarine and freshwater invertebrates. The EEC of 14 pptr (based on 21 day EEC) exceeds the LOEL for mysid shrimp(LOEL= 0.38 pptr) by as much as 34 times.

The EEC of 14 pptr (based on 21 day EEC) exceeds the LOEL(3.5 pptr) by 3.7 times for Daphnia magna. The LOEL from the mysid and daphnid life cycle is the level of concern which, if exceeded, signifies potential for serious chronic effects to freshwater and estuarine invertebrates.

An interesting note, the effects observed in the fish life cycle, specifically the significant decrease in F1 weight and length coincides with the observations made in the mesocosm study. In other words in both studies, the juvenile length and weight were among the most sensitive parameters measured in the studies.

Considering that the loading from cotton is equivalent to the maximum reported residues in the high dose ponds in the

mesocosm study, EEB has determined that there will be a significant impact to the aquatic environment, since there was a significant impact at a rate of 0.01 of the proposed use rate on cotton.

101.4 Adequacy of Toxicity Data

EEB has completed the review of three responses to previously submitted studies. The citations and results are as follows:

C.A. Smith, G.W. Gorder. 1990. ICI Response to the July 26, 1990 EEB Review of the Repeat PP321 Mallard Reproduction Study. Referenced Report No. ICI Volume No. 61, Wildlife International Laboratory Project No. 123-143, MRID No. 415121-01.

Based on the additional information submitted, the study is determined to be scientifically sound, and is classified as CORE. This study satisfies data requirements for the avian reproduction study for the mallard duck Guideline Reference No. 71-4. Based on the results from this study, the NOEL for reproductive effects to the mallard duck is 30 ppm. A LOEL was not ascertained since 30 ppm was the highest dose tested. There was an increase in "old yolk peritonitis" at the 5 ppm dose. The residues were also measured in the egg and the fat and liver of the bird. A statistical analysis was conducted on the residues in the egg and the fat and liver of the birds. The results are as follows:residues in egg NOEL= 5 ppm and LOEL = 15 ppm, residues in liver NOEL = 30 ppm, residues in fat with a NOEL = 15 ppm and a LOEL = 30 ppm.

J.F. Tapp, C.A. Smith. 1990. ICI Response to the July 26, 1990 EEB Review of the PP321 Fish Life Cycle Study. ICI Group Environmental Laboratory, Brixham, Devon, United Kingdom. ICI Volume 62, ICI Report No. BL/B/3476, MRID 41519001.

Based on the additional information submitted, the study has been classified as SUPPLEMENTAL. The study satisfies the data requirement for Guideline Reference No. 72-5. The study cannot be upgraded based on the discrepancies outlined in the data evaluation record. However, EEB has determined that the study provides adequate information to determine the chronic toxicity effects of lamda-cyhalothrin to fathead minnow. Based on the results of the study, the following parameters were the most sensitive with a NOEL of 31 pptr and a LOEL of 62 pptr: F1 Survival at 28 days; F0 length at 56 days; F0 Male length and weight at 300 days, and F1 weight and length at 31 days.

Farrelly, E. and M. J. Hamer, 1990. ICI Response to June 21, 1990 EEB Review of the PP321 Daphnia Life Cycle Study. ICI Agrochemicals. Jeallott's Hill Research Station, Bracknell, Berks, United Kingdom, ICI Report No. RJ0764B, MRID NO. 41217501.

Based on the additional information submitted, the study has been classified as SUPPLEMENTAL. The study satisfies the data requirement for Guideline Reference No. 72-4. The study cannot be upgraded based on the discrepancies outlined in the data evaluation record. However, EEB has determined that the study provides adequate information to determine the chronic toxicity effects of lamda-cyhalothrin to Daphnia magna. Based on the results of the study, both the number of young per female and adult survival were the most sensitive with a NOEL of 1.98 pptr and a LOEL of 3.5 pptr.

Additional Data

All the data requirements have been satisfied to support registration of lambda cyhalothrin for use on cotton.

101.5 Adequacy of Labeling

The following precautionary labeling and use restrictions are required:

This pesticide is extremely toxic to fish and aquatic invertebrates and toxic to wildlife. Do not apply directly to water or areas where surface water is present, or to intertidal areas below the mean high water mark. Do not apply when weather conditions favor drift from treated areas. Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not apply through any type of irrigation systems. Do not contaminate water when disposing of equipment washwaters.

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

102.0 Classification

The Special Review Criteria, as well as the Restricted Use Criteria have been exceeded for aquatic invertebrates. The EEC is approximately the same level as the Special Review Criteria (1/2 LC 50 for fish is 105 pptr and the EEC was 102 pptr). The restricted use criteria have been exceeded for fish. All the criteria for aquatic organisms has been exceeded, therefore, this pesticide is required to be classified as a "Restricted Use Pesticide."

Endangered Species Restrictions

Based on the available toxicity and exposure information, the endangered species criteria are exceeded for both freshwater and marine fish and invertebrates. According to Larry Turner, (personal communications 3/19/93), there are many endangered freshwater aquatic species as well as a few terrestrial insects that may at risk from the use of this chemical in the counties where cotton is grown. Attachment B is a list of species by state and county that might be affected by the use of this chemical. EEB does not have at this time sufficient information to determine if the species in these counties are in proximity to where cotton actually is or could be grown.

Incident Data

There are two fish kill incidents that have been reported from the use of this chemical in cotton fields. Both occurred in 1991 in Georgia. One problem that has been reported consistently amongst the various cotton growing states, is that the state laboratories lack the analytical technology and resources to measure the synthetic pyrethroids at the levels that the fish kills occur. In other words, many more incidents may have occurred than what has been actually been reported, but the states are not capable of confirming the incident was caused by the particular synthetic pyrethroid.

103.0 Conclusion

Based on the available toxicity data and the estimated exposure data, the use of this pesticide will undoubtedly pose a risk to fish and aquatic invertebrates.

An interesting note, the effects observed in the fish life cycle, specifically the significant decrease in F1 weight and length coincides with the observations made in the mesocosm study. In other words in both studies, the juvenile length and weight were most sensitive parameters measured in the studies.

Considering that the loading from cotton is equivalent to the maximum reported residues in the high dose ponds in the mesocosm study, EEB has determined that there will be a significant impact to the aquatic environment, since there was a significant impact at a rate of 0.01 of the proposed use rate on cotton.

Based on all of the above information it is evident that the use of this pesticide will pose a serious risk to nontarget aquatic organisms. The levels of concern for acute and chronic effects to aquatic and estuarine invertebrates have been exceeded. It is apparent from all of the data EEB has reviewed that this compound is very highly toxic to aquatic organisms, the use pattern provides for significant exposure, and that fish populations are expected to be impaired.

Attachments

Candace Brassard 3/29/93
Candace Brassard
Ecological Effects Branch
Environmental Fate and Effects Division (H7507C)

Dan Rieder 3.29.93
Dan Rieder, Section Head III
Ecological Effects Branch
Environmental Fate and Effects Division (H7507C)

Anthony F. Maciorowski, Chief 3.30.93
Ecological Effects Branch
Environmental Fate and Effects Division (H7507C)

CITATIONS

Gusey, W. F. and Z. D. Maturgo. 1973. Wildlife Utilization of Croplands. Environmental Affairs, Shell Oil Company, Houston, Texas.

Jones, David. 1993. Personal Communications. Environmental Fate and Groundwater Branch, Environmental Fate and Effects Division, EPA, Washington, D.C. 20460.

Maciorowski, Anthony F. 1993. Memorandum "Use sites that may Requires Estuarine Tests". Ecological Effects Branch, Environmental Fate and Effects Division, EPA, Washington, D.C. 20460.

Parker, Ron. 1993. Personal Communications. Environmental Fate and Groundwater Branch, Environmental Fate and Effects Division, EPA, Washington, D.C. 20460.

Petrie, Rick. 1993. Personal Communications. Ecological Effects Branch, Environmental Fate and Effects Division, EPA, Washington, D.C. 20460.

Stavola, Ann. 1988. Personal Communications. Ecological Effects Branch, Environmental Fate and Effects Division, EPA, Washington, D.C. 20460.

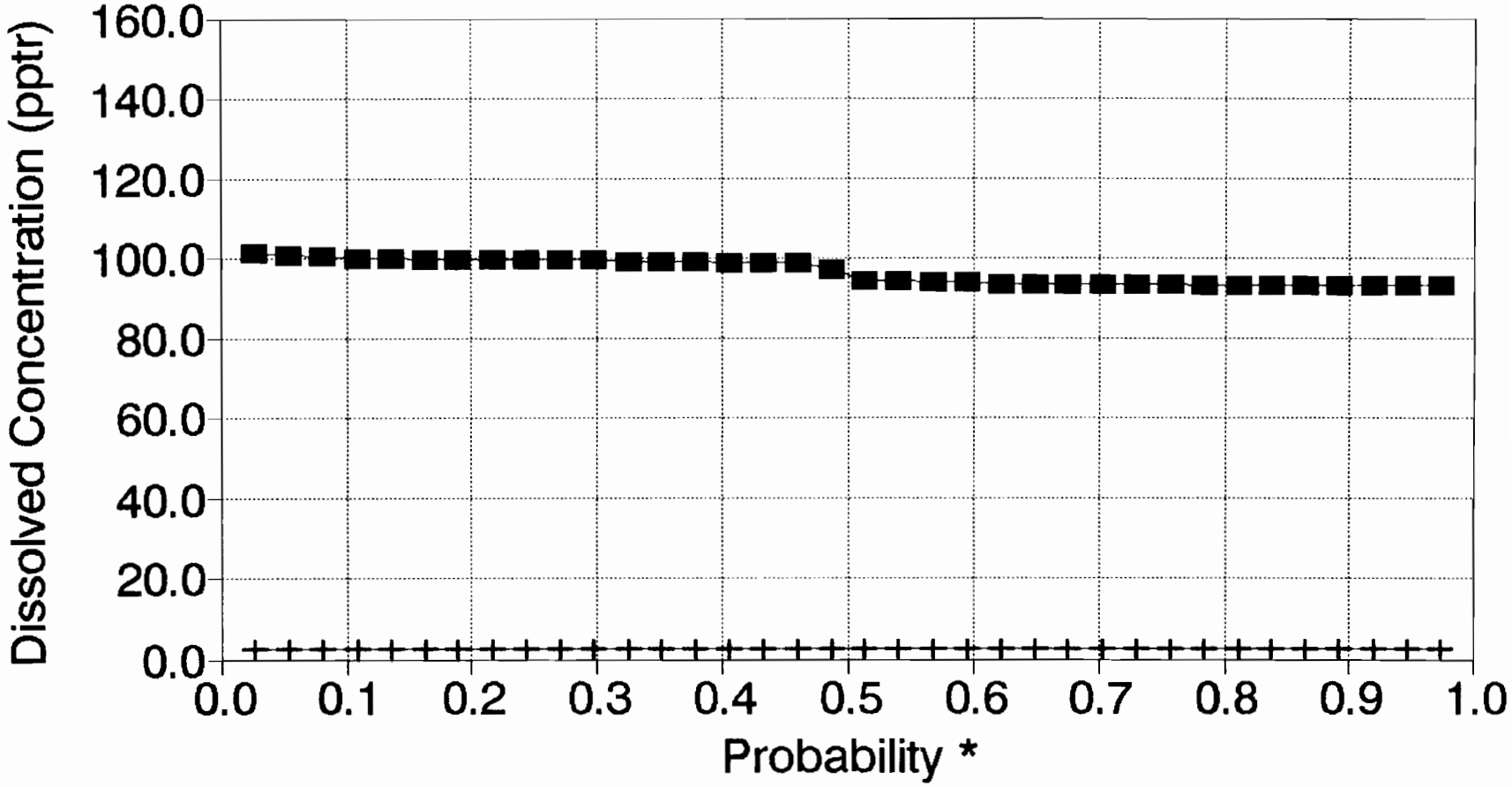
Turner, Larry. 1993. Personal Communications. Ecological Effects Branch, Environmental Fate and Effects Division, EPA, Washington, D.C. 20460.

U.S. Department of Agriculture. 1991. Agricultural Statistics. United States Government Printing Office. Washington:1991.

U.S. Department od Commerce. 1987. 1987 Census of Agriculture. Volume 1 Part 37 Oregon Sate and County Data. Bureau of Census. U.S. Government Printing Office, Washington, D.C. 20402.

Karate Use on Cotton

EEC vs. Invertebrate(1/2 LC50)



Probability applies only to EEC

EEC 1/2 LC 50

Attachment H

Front Panel

RESTRICTED USE PESTICIDE
Toxic to Fish and Aquatic Organisms

For retail sale to and use only by Certified Applicators, or persons under their direct supervision, and only for those uses covered by the Certified Applicator's certification.

KARATE® Insecticide

For Use to Control Certain Insects on Cotton

ACTIVE INGREDIENT:

Lambda-cyhalothrin [1α(S*),3α(Z)]-(±)-cyano-(3-phenoxyphenyl)methyl-3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropanecarboxylate	13.1%
INERT INGREDIENTS:	86.9%
Total	100.0%

KARATE contains 1 pound of active ingredient per gallon and is an emulsifiable concentrate.

EPA Reg. No. 10182-96
EPA Est. No. 10182-

Net Contents:

KEEP OUT OF REACH OF CHILDREN

DANGER

PELIGRO
PRECAUCION AL USUARIO: Si usted no lee ingles, no use este producto hasta que la etiqueta le haya sido explicada ampliamente.

See Side Panel for Additional Precautionary Statements

Made in U.S.A.
ICI Agricultural Products
ICI Americas Inc.
Wilmington, DE 19897

ACCEPTED
with COMMENTS
In EPA Letter Dated

NOV 12 1992

Under the Federal Insecticide, Fungicide, and Rodenticide Act as amended, for the pesticide registered under EPA Reg. No.

10182-96

STATEMENT OF PRACTICAL TREATMENT

IF ON SKIN: Wash with plenty of soap and water. Get medical attention if irritation persists.

IF SWALLOWED: Do not induce vomiting. Call a physician immediately.

IF INHALED: Remove victim to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. Get medical attention.

IF IN EYES: Hold eyelids open and flush with steady, gentle stream of water. Remove any contact lenses and repeat flushing procedure for several minutes. Get medical attention if irritation persists.

NOTE TO PHYSICIAN: Induced vomiting as first aid for this substance may result in increased risk of chemical pneumonia or pulmonary edema caused by aspiration of the hydrocarbon solvent. Vomiting should be induced only under professional supervision.

FOR 24-HOUR EMERGENCY MEDICAL ASSISTANCE, CALL 1-800-F-A-S-T-M-E-D (327-8633).

FOR CHEMICAL EMERGENCY: Spill, leak, fire, exposure, or accident call CHEMTREC 1-800-424-9300.

Side Panel

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

CORROSIVE. CAUSES SKIN DAMAGE. MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES EYE INJURY. HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE ALLERGIC SKIN REACTIONS. **DO NOT** get on skin, in eyes, or on clothing. **DO NOT** breathe spray mist. **WEAR** a mask or pesticide respirator approved by NIOSH under the provisions of 30 CFR 11. **WEAR** goggles or face shield, protective clothing, and rubber gloves when mixing. **WASH** thoroughly with soap and water after handling and before eating, drinking, or using tobacco. **REMOVE** contaminated clothing and wash before reuse.

Skin exposure may also result in a sensation described as a tingling, itching, burning, or prickly feeling. Onset may occur immediately to 4 hours after exposure and may last 2 to 30 hours, without damage. Wash exposed area once with soap and water. Relief from the skin sensation may be obtained by applying an oil-based cream.

REFER TO THE ATTACHED LABEL BOOKLET FOR DETAILED PROTECTIVE CLOTHING AND HUMAN FLAGGER DIRECTIONS.

ENVIRONMENTAL HAZARDS

This pesticide is extremely toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not apply when weather conditions favor drift from treated areas. Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwaters.

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

PHYSICAL AND CHEMICAL HAZARDS

Do not use or store near heat or open flame.

Back Panel

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product through any type of irrigation system.

Refer to attached booklet for use directions.

REENTRY STATEMENTS

Do not apply this product in such a manner as to directly or through drift expose workers or other persons. The area being treated must be vacated by unprotected persons. Do not enter treated areas without protective clothing until sprays have dried. Because certain states may require more restrictive reentry intervals for various crops treated with this product, consult your State Department of Agriculture for further information.

STORAGE AND DISPOSAL

PROHIBITIONS: Do not contaminate water, food, or feed by storage and disposal.

STORAGE: Store in original containers only. Keep container closed when not in use. Do not store near food or feed. In case of spill or leak on floor or paved surfaces, soak up with sand, earth, or synthetic absorbent. Remove to chemical waste area.

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL
Metal Containers: Triple rinse (or equivalent); then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by State and local authorities.

Plastic Containers: Triple rinse (or equivalent); then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

FOR BOOMERANG CONTAINERS

CONTAINER DISPOSAL: Return container to ICI Americas Inc. for reuse with seal intact and in salable condition.

FOR BULK/MINI-BULK CONTAINERS

CONTAINER DISPOSAL
Plastic Containers: Reseal container and offer for reconditioning, or triple rinse (or equivalent) and offer for recycling or reconditioning, or clean in accordance with manufacturer's instructions.

FOR EZ HANDLER CONTAINERS

CONTAINER DISPOSAL
Plastic Containers: Triple rinse (or equivalent); then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

FOR MINI-BULK AND E-Z HANDLER CONTAINERS

CONTAINER PRECAUTIONS
Before refilling, inspect thoroughly for damage such as cracks, punctures, bulges, dents, abrasions, and damaged or worn threads on closure devices.

REFILL ONLY WITH KARATE INSECTICIDE. The contents of this container cannot be completely removed by cleaning. Refilling with materials other than KARATE insecticide will result in contamination and may weaken container.

After filling and before transporting, check for leaks.

Do not refill or transport damaged or leaking container.

CONTAINER IS NOT SAFE FOR FOOD, FEED, OR DRINKING WATER!

IMPORTANT: Read the entire Directions for Use and the Conditions of Sale and Warranty before using this product.

CONDITIONS OF SALE AND LIMITED WARRANTY:

The Directions for Use of this product are believed to be reliable and should be followed carefully. However, it is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as timing and method of application, weather and crop conditions, mixture with other chemicals not specifically recommended or other influencing factors in the use of the product, all of which are beyond the control of the seller. All such risks shall be assumed by Buyer and User, and Buyer and User agree to hold Seller harmless for any claims relating to such factors.

Seller warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label, subject to the inherent risks referred to above, when used in accordance with directions under normal conditions of use. This warranty does not extend to the use of this product contrary to label instructions, or under abnormal conditions or under conditions not reasonably foreseeable to or beyond the control of Seller and Buyer and User assume the risk of any such use. SELLER DISCLAIMS ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING ANY WARRANTY OF FITNESS OR MERCHANTABILITY.

When Buyer or User claims losses or damages resulting from the use or handling of this product (including claims based on contract, negligence, strict liability or other legal theories), Buyer or User must promptly notify in writing Seller of any claims to be eligible to receive either of the remedies set forth below. The EXCLUSIVE REMEDY OF BUYER OR USER and the LIMIT OF LIABILITY of Seller will be, at the election of Seller, refund of the purchase price paid for product bought, or replacement of amount of product used. SELLER SHALL NOT BE LIABLE FOR CONSEQUENTIAL, SPECIAL OR INDIRECT DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT AND SELLER'S SOLE LIABILITY AND BUYER'S AND USER'S EXCLUSIVE REMEDY SHALL BE LIMITED TO THE REFUND OF THE PURCHASE PRICE.

KARATE® is a trademark of an ICI Group Company.

RESTRICTED USE PESTICIDE
Toxic to Fish and Aquatic Organisms

For retail sale to and use only by Certified Applicators, or persons under their direct supervision, and only for those uses covered by the Certified Applicator's certification.

KARATE® Insecticide

FOR USE TO CONTROL CERTAIN INSECTS ON COTTON

COMPLETE DIRECTIONS FOR USE

EPA Reg. No. 10182-96
EPA Est. No. 10182-

Made in U.S.A.
ICI Agricultural Products
ICI Americas Inc.
Wilmington, DE 19897

KEEP OUT OF REACH OF CHILDREN

DANGER

PELIGRO
PRECAUCION AL USUARIO: Si usted no lee ingles, no use este producto hasta que la etiqueta le haya sido explicada ampliamente.

ACTIVE INGREDIENT:	**By Wt.**
Lambda-cyhalothrin [1α(*S**),3α(*Z*)]-(±)-cyano-(3-phenoxyphenyl)methyl-3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropanecarboxylate	13.1%
INERT INGREDIENTS:	86.9%
Total	100.0%

KARATE contains 1 pound of active ingredient per gallon and is an emulsifiable concentrate.

STATEMENT OF PRACTICAL TREATMENT

IF ON SKIN: Wash with plenty of soap and water. Get medical attention if irritation persists.

IF SWALLOWED: Do not induce vomiting. Call a physician immediately.

IF INHALED: Remove victim to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. Get medical attention.

IF IN EYES: Hold eyelids open and flush with steady, gentle stream of water. Remove any contact lenses and repeat flushing procedure for several minutes. Get medical attention if irritation persists.

NOTE TO PHYSICIAN: Induced vomiting as first aid for this substance may result in increased risk of chemical pneumonia or pulmonary edema caused by aspiration of the hydrocarbon solvent. Vomiting should be induced only under professional supervision.

FOR 24-HOUR EMERGENCY MEDICAL ASSISTANCE, CALL 1-800-F-A-S-T-M-E-D (327-8633).

FOR CHEMICAL EMERGENCY: Spill, leak, fire, exposure, or accident call CHEMTREC 1-800-424-9300.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

CORROSIVE. CAUSES SKIN DAMAGE. MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES EYE INJURY. HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE ALLERGIC SKIN REACTIONS. **DO NOT** get on skin, in eyes, or on clothing. **DO NOT** breathe spray mist. **WEAR** a mask or pesticide respirator approved by NIOSH under the provisions of 30 CFR 11. **WEAR** goggles or face shield, protective clothing, and rubber gloves when mixing. **WASH** thoroughly with soap and water after handling and before eating, drinking, or using tobacco. **REMOVE** contaminated clothing and wash before reuse.

WEAR THE FOLLOWING PROTECTIVE CLOTHING AND EQUIPMENT WHEN HANDLING THE CONCENTRATE AND DURING APPLICATION, EQUIPMENT REPAIR, CLEANING, DISPOSAL OF THE SPRAY SOLUTION, AND DURING EARLY REENTRY TO TREATED AREAS.

Wear a protective suit of one or two pieces that covers all parts of the body except the head, hands, and feet. Wear chemical resistant gloves and chemical resistant boots, shoes, or shoe coverings. Wear goggles or face shield. A helmet with visor is acceptable during application from nonenclosed cockpits. Wear a pesticide respirator approved by the National Institute for Occupational Safety and Health under the provisions of 30 CFR 11.

During application only from a tractor with a completely enclosed cab or aerially with an enclosed cockpit, long sleeve shirt and long legged pants may be worn in place of the above protective equipment. Chemical resistant gloves must be made available in the cab or cockpit and must be worn while exiting. This clothing is inadequate to protect you during equipment repairs, equipment cleaning, spray solution disposal or early reentry.

IMPORTANT! Before removing gloves, wash hands with soap and water. Always wash hands before smoking, eating, drinking, or toileting.

Skin exposure may also result in a sensation described as a tingling, itching, burning, or prickly feeling. Onset may occur immediately to 4 hours after exposure and may last 2 to 30 hours, without damage. Wash exposed areas once with soap and water. Relief from the skin sensation may be obtained by applying an oil-based cream.

HUMAN FLAGGERS IN THE TREATED AREA MUST EITHER BE IN TOTALLY ENCLOSED VEHICLES OR WEAR A PROTECTIVE SUIT, CHEMICAL-RESISTANT GLOVES; A CHEMICAL-RESISTANT HAT WITH A WIDE BRIM OR A HOOD; CHEMICAL-RESISTANT SHOES, SHOE COVERS OR BOOTS; A RESPIRATORY PROTECTIVE DEVICE, AND A FACE SHIELD.

ENVIRONMENTAL HAZARDS

This pesticide is extremely toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not apply when weather conditions favor drift from treated areas. Drift and runoff

from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwaters.

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

PHYSICAL AND CHEMICAL HAZARDS

Do not use or store near heat or open flame.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

This labeling must be in the possession of the user at the time of application.

Do not apply this product through any type of irrigation system.

Resistance: Some insects are known to develop resistance to products used repeatedly for control. Because the development of resistance cannot be predicted, the use of this product should conform to resistance management strategies established for the use area. Consult your local or state agricultural authorities for details.

If resistance to this product develops in your area, this product, or other products with a similar mode of action, may not provide adequate control. If poor performance cannot be attributed to improper application or extreme weather conditions, a resistant strain of insect may be present. If you experience difficult with control and resistance is a reasonable cause, immediately consult your local company representative or agricultural advisor for the best alternative method of control for your area.

REENTRY STATEMENTS

Do not apply this product in such a manner as to directly or through drift expose workers or other persons. The area being treated must be vacated by unprotected persons. Do not enter treated areas without protective clothing until sprays have dried. Because certain states may require more restrictive reentry intervals for various crops treated with this product, consult your State Department of Agriculture for further information.

Apply KARATE® insecticide as shown in the following chart:

SPRAY RECOMMENDATIONS

Crop	Target Pests	Rate		Remarks
		lb ai/A	fl oz/A	

Cotton	Thrips Spp.
	Tobacco Thrips
	Soybean Thrips
		0.01-0.02	1.28-2.56	• Apply as required by scouting, usually at intervals of 5 to 7 days. Timing and frequency of applications should be based upon insect populations reaching locally determined economic thresholds.
				• Apply with ground or air equipment using sufficient water to obtain full coverage of foliage.
				• Applications may also be made with equipment adapted and calibrated for ULV sprays. KARATE may be mixed with once-refined vegetable oil and applied in a minimum of at least one quart of finished spray per acre.
				• Under light bollworm/budworm infestation levels, 0.02 lb ai/A may be applied in conjunction with intense field monitoring.
				• For boll weevil control spray on a 3 to 5 day schedule.
				• When applied according to label directions for control of cotton bollworm and tobacco budworm, KARATE insecticide also provides ovicidal control of unhatched *Heliothis* spp. eggs.
				• Do not apply within 21 days of harvest.
				• Do not graze livestock in treated areas.
				• Do not apply more than 1.6 pints (0.2 lb ai) per acre per season.
				• Do not make more than a total of 10 synthetic pyrethroid applications (of one product or combination of products) to a cotton crop in one growing season. Synthetic pyrethroid products include AMBUSH® insecticide, Ammo® insecticide, Asana® XL insecticide, Baythroid® emulsifiable pyrethroid insecticide, Capture® insecticide/miticide, CYMBUSH® insecticide, KARATE® insecticide, Pounce® insecticide, and Scout® insecticide.
				• Do not apply by ground within 25 feet, or by air within 75 feet of lakes; reservoirs; rivers; permanent streams, marshes or natural ponds; estuaries and commercial fish farm ponds.
				• SPRAY DRIFT PRECAUTIONS
				  • All aerial and ground application equipment must be properly maintained and calibrated using appropriate carriers.
				  • Do not make aerial or ground applications during temperature inversions.
				  • Make aerial or ground applications when the wind velocity favors on-target product deposition (approximately 3 to 10 mph). Do not apply when wind velocity exceeds 15 mph.
				  • For aerial applications, the spray boom must be mounted on the aircraft so as to minimize drift caused by wingtip or rotor vortices. Boom length must not exceed 75% of wing span or rotor diameter.

	Lygus Bugs Pink Bollworm Cabbage Looper Cotton Leafperforator Cutworm Spp. Saltmarsh Caterpillar Cotton Leafworm Cotton Fleahopper	0.02-0.03	2.56-3.84	
	Cotton Bollworm Tobacco Budworm Boll Weevil Fall Armyworm Beet Armyworm* European Corn Borer Brown Stink Bug Green Stink Bug Southern Green Stink Bug Twospotted Spider Mite** Cotton Aphid** Bandedwing Whitefly** Sweetpotato Whitefly**	0.025-0.04	3.20-5.12	

* For control of the first and second instar only.
** Suppression only.

STORAGE AND DISPOSAL

PROHIBITIONS: Do not contaminate water, food, or feed by storage and disposal.

STORAGE: Store in original containers only. Keep container closed when not in use. Do not store near food or feed. In case of spill or leak on floor or paved surfaces, soak up with sand, earth, or synthetic absorbent. Remove to chemical waste area.

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FOR BOOMERANG CONTAINERS

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FOR BULK/MINI-BULK CONTAINERS

CONTAINER DISPOSAL
Plastic Containers: Reseal container and offer for reconditioning, or triple rinse (or equivalent) and offer for recycling or reconditioning, or clean in accordance with manufacturer's instructions.

FOR EZ HANDLER CONTAINERS

CONTAINER DISPOSAL
Plastic Containers: Triple rinse (or equivalent); then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

FOR MINI-BULK AND E-Z HANDLER CONTAINERS

CONTAINER PRECAUTIONS
Before refilling, inspect thoroughly for damage such as cracks, punctures, bulges, dents, abrasions, and damaged or worn threads on closure devices.

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After filling and before transporting, check for leaks.

Do not refill or transport damaged or leaking container.

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IMPORTANT: Read the entire Directions for Use and the Conditions of Sale and Warranty before using this product.

CONDITIONS OF SALE AND LIMITED WARRANTY:

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Seller warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label, subject to the inherent risks referred to above, when used in accordance with directions under normal conditions of use. This warranty does not extend to the use of this product contrary to label instructions, or under abnormal conditions or under conditions not reasonably foreseeable to or beyond the control of Seller and Buyer and User assume the risk of any such use. SELLER DISCLAIMS ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING ANY WARRANTY OF FITNESS OR MERCHANTABILITY.

When Buyer or User claims losses or damages resulting from the use or handling of this product (including claims based on contract, negligence, strict liability or other legal theories), Buyer or User must promptly notify in writing Seller of any claims to be eligible to receive either of the remedies set forth below. The EXCLUSIVE REMEDY OF BUYER OR USER and the LIMIT OF LIABILITY of Seller will be, at the election of Seller, refund of the purchase price paid for product bought, or replacement of amount of product used. SELLER SHALL NOT BE LIABLE FOR CONSEQUENTIAL, SPECIAL OR INDIRECT DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT AND SELLER'S SOLE LIABILITY AND BUYER'S AND USER'S EXCLUSIVE REMEDY SHALL BE LIMITED TO THE REFUND OF THE PURCHASE PRICE.

RATE CONVERSION CHART

LB AI PER ACRE	FL OZ PER ACRE	PINTS PER ACRE	TREATED ACRES PER GALLON
0.01	1.28	0.08	100
0.02	2.56	0.16	50
0.025	3.20	0.20	40
0.03	3.84	0.24	33
0.04	5.12	0.32	25

ATTACHMENT B

ENDANGERED SPECIES OCCURRING IN COUNTIE
WHERE COTTON IS GROWN WITHIN GROUPS
ARACHNID, CLAM, FISH, AND INSECT

COUNTY	STATUS	SPECIES	COTTON ACREAGE	GROUP	COUNT
** STATE: AL					
BALDWIN	L	STURGEON, GULF	848	FISH	1
BIBB	L	DARTER, GOLDLINE	420	FISH	1
BIBB	L	SHINER, CAHABA	420	FISH	1
BLOUNT	L	DARTER, WATERCRESS	1655	FISH	1
CALHOUN	L	SCULPIN, PYGMY	551	FISH	1
CALHOUN	L	SHINER, BLUE	551	FISH	1
CHEROKEE	L	SHINER, BLUE	13206	FISH	1
COLBERT	L	CAVEFISH, ALABAMA	34518	FISH	1
COLBERT	L	PEARLY MUSSEL, ORANGE-FOOTED	34518	CLAM	1
COLBERT	L	PEARLY MUSSEL, PINK MUCKET	34518	CLAM	1
COLBERT	L	PEARLY MUSSEL, ROUGH PIGTOE	34518	CLAM	1
COLBERT	L	PEARLY MUSSEL, WHITE WARTYBACK	34518	CLAM	1
LAMAR	L	MUSSEL, PENITENT	993	CLAM	1
LAMAR	L	STIRRUP SHELL	993	CLAM	1
LAUDERDALE	L	CAVEFISH, ALABAMA	22688	FISH	1
LAUDERDALE	L	DARTER, SLACKWATER	22688	FISH	1
LAUDERDALE	L	PEARLY MUSSEL, ORANGE-FOOTED	22688	CLAM	1
LAUDERDALE	L	PEARLY MUSSEL, PINK MUCKET	22688	CLAM	1
LAUDERDALE	L	PEARLY MUSSEL, ROUGH PIGTOE	22688	CLAM	1
LAUDERDALE	L	PEARLY MUSSEL, WHITE WARTYBACK	22688	CLAM	1
LIMESTONE	L	DARTER, BOULDER	49284	FISH	1
LIMESTONE	L	DARTER, SLACKWATER	49284	FISH	1
LIMESTONE	L	DARTER, SNAIL	49284	FISH	1
LIMESTONE	L	PEARLY MUSSEL, SHINY PIGTOE	49284	CLAM	1
LIMESTONE	L	RIFFLE SHELL, TAN	49284	CLAM	1
MADISON	L	DARTER, SLACKWATER	30061	FISH	1
MADISON	L	DARTER, SNAIL	30061	FISH	1
MADISON	L	PEARLY MUSSEL, ORANGE-FOOTED	30061	CLAM	1
MADISON	L	PEARLY MUSSEL, PINK MUCKET	30061	CLAM	1
MADISON	L	PEARLY MUSSEL, ROUGH PIGTOE	30061	CLAM	1
MADISON	L	RIFFLE SHELL, TAN	30061	CLAM	1
MARSHALL	L	DARTER, SNAIL	495	FISH	1
MARSHALL	L	DARTER, WATERCRESS	495	FISH	1
MARSHALL	L	PEARLY MUSSEL, ORANGE-FOOTED	495	CLAM	1
MARSHALL	L	PEARLY MUSSEL, PINK MUCKET	495	CLAM	1
MARSHALL	L	PEARLY MUSSEL, ROUGH PIGTOE	495	CLAM	1
MORGAN	L	DARTER, SNAIL	3797	FISH	1
MORGAN	L	PEARLY MUSSEL, ORANGE-FOOTED	3797	CLAM	1
MORGAN	L	PEARLY MUSSEL, PINK MUCKET	3797	CLAM	1
MORGAN	L	PEARLY MUSSEL, ROUGH PIGTOE	3797	CLAM	1
PICKENS	L	MUSSEL, JUDGE TAIT'S	4419	CLAM	1
PICKENS	L	STIRRUP SHELL	4419	CLAM	1
SHELBY	L	DARTER, GOLDLINE	4679	FISH	1

ENDANGERED SPECIES OCCURRING IN COUNTIE
WHERE COTTON IS GROWN WITHIN GROUPS
ARACHNID, CLAM, FISH, AND INSECT

COUNTY	STATUS	SPECIES	COTTON ACREAGE	GROUP	COUNT
SHELBY	L	SHINER, CAHABA	4679	FISH	1
** Subtotal **			791000		44
** STATE: AR					
CHICOT	L	STURGEON, PALLID	36883	FISH	1
CLAY	L	PEARLY MUSSEL, PINK MUCKET	11813	CLAM	1
CRAIGHEAD	L	MUSSEL, FAT POCKETBOOK	55942	CLAM	1
CRITTENDEN	L	STURGEON, PALLID	23340	FISH	1
CROSS	L	MUSSEL, FAT POCKETBOOK	1491	CLAM	1
DESHA	L	MUSSEL, FAT POCKETBOOK	45963	CLAM	1
DESHA	L	PEARLY MUSSEL, PINK MUCKET	45963	CLAM	1
DESHA	L	STURGEON, PALLID	45963	FISH	1
LEE	L	MUSSEL, FAT POCKETBOOK	14133	CLAM	1
LEE	L	STURGEON, PALLID	14133	FISH	1
MISSISSIPPI	L	MUSSEL, FAT POCKETBOOK	80414	CLAM	1
MISSISSIPPI	L	STURGEON, PALLID	80414	FISH	1
MONROE	L	MUSSEL, FAT POCKETBOOK	19466	CLAM	1
MONROE	L	PEARLY MUSSEL, PINK MUCKET	19466	CLAM	1
PHILLIPS	L	MUSSEL, FAT POCKETBOOK	32865	CLAM	1
PHILLIPS	L	PEARLY MUSSEL, PINK MUCKET	32865	CLAM	1
PHILLIPS	L	STURGEON, PALLID	32865	FISH	1
POINSETT	L	MUSSEL, FAT POCKETBOOK	36355	CLAM	1
ST. FRANCIS	L	MUSSEL, FAT POCKETBOOK	10336	CLAM	1
WOODRUFF	L	MUSSEL, FAT POCKETBOOK	2810	CLAM	1
WOODRUFF	L	PEARLY MUSSEL, PINK MUCKET	2810	CLAM	1
** Subtotal **			646290		21
** STATE: AZ					
COCHISE	L	CATFISH, YAQUI	17206	FISH	1
COCHISE	L	CHUB, YAQUI	17206	FISH	1
COCHISE	L	PUPFISH, DESERT	17206	FISH	1
COCHISE	L	SHINER, BEAUTIFUL	17206	FISH	1
COCHISE	L	TOPMINNOW, GILA (YAQUI)	17206	FISH	1
GRAHAM	L	MINNOW, LOACH	23163	FISH	1
GRAHAM	L	PUPFISH, DESERT	23163	FISH	1
GRAHAM	L	SPIKEDACE	23163	FISH	1
GRAHAM	L	SUCKER, RAZORBACK	23163	FISH	1
GRAHAM	L	TOPMINNOW, GILA (YAQUI)	23163	FISH	1
GRAHAM	L	TROUT, APACHE	23163	FISH	1
LA PAZ	L	CHUB, BONYTAIL	16361	FISH	1
LA PAZ	L	PUPFISH, DESERT	16361	FISH	1
LA PAZ	L	SUCKER, RAZORBACK	16361	FISH	1

ENDANGERED SPECIES OCCURRING IN COUNTIE
WHERE COTTON IS GROWN WITHIN GROUPS
ARACHNID, CLAM, FISH, AND INSECT

COUNTY	STATUS	SPECIES	COTTON ACREAGE	GROUP	COUNT
MARICOPA	L	PUPFISH, DESERT	144219	FISH	1
PIMA	L	PUPFISH, DESERT	13406	FISH	1
PIMA	L	TOPMINNOW, GILA (YAQUI)	13406	FISH	1
PINAL	L	MINNOW, LOACH	127639	FISH	1
PINAL	L	PUPFISH, DESERT	127639	FISH	1
PINAL	L	SPIKEDACE	127639	FISH	1
PINAL	L	TOPMINNOW, GILA (YAQUI)	127639	FISH	1
YUMA	L	SUCKER, RAZORBACK	34849	FISH	1
** Subtotal **			990527		22
** STATE: CA					
FRESNO	L	BEETLE, VALLEY ELDERBERRY LONGHORN	306603	INSECT	1
FRESNO	L	TROUT, LITTLE KERN GOLDEN	306603	FISH	1
FRESNO	L	TROUT, PAIUTE CUTTHROAT	306603	FISH	1
IMPERIAL	L	CHUB, BONYTAIL	22061	FISH	1
IMPERIAL	L	PUPFISH, DESERT	22061	FISH	1
IMPERIAL	L	SQUAWFISH, COLORADO	22061	FISH	1
IMPERIAL	L	SUCKER, RAZORBACK	22061	FISH	1
KERN	L	MOTH, KERN PRIMROSE SPHINX	275404	INSECT	1
MADERA	L	BEETLE, VALLEY ELDERBERRY LONGHORN	33290	INSECT	1
MADERA	L	TROUT, LAHONTAN CUTTHROAT	33290	FISH	1
MADERA	L	TROUT, PAIUTE CUTTHROAT	33290	FISH	1
MERCED	L	BEETLE, VALLEY ELDERBERRY LONGHORN	58355	INSECT	1
RIVERSIDE	L	CHUB, BONYTAIL	19875	FISH	1
RIVERSIDE	L	PUPFISH, DESERT	19875	FISH	1
RIVERSIDE	L	SQUAWFISH, COLORADO	19875	FISH	1
RIVERSIDE	L	SUCKER, RAZORBACK	19875	FISH	1
TULARE	L	TROUT, LITTLE KERN GOLDEN	131758	FISH	1
** Subtotal **			1652940		17
** STATE: FL					
ESCAMBIA	L	STURGEON, GULF	3168	FISH	1
JACKSON	L	STURGEON, GULF	2285	FISH	1
OKALOOSA	L	DARTER, OKALOOSA	694	FISH	1
OKALOOSA	L	STURGEON, GULF	694	FISH	1
SANTA ROSA	L	STURGEON, GULF	14920	FISH	1
WALTON	L	DARTER, OKALOOSA	455	FISH	1
WALTON	L	STURGEON, GULF	455	FISH	1

ENDANGERED SPECIES OCCURRING IN COUNTIE
WHERE COTTON IS GROWN WITHIN GROUPS
ARACHNID, CLAM, FISH, AND INSECT

COUNTY	STATUS	SPECIES	COTTON ACREAGE	GROUP	COUNT
** Subtotal **			22671		7
** STATE: GA					
APPLING	L	STURGEON, SHORTNOSE	588	FISH	1
BURKE	L	STURGEON, SHORTNOSE	9603	FISH	1
JEFF DAVIS	L	STURGEON, SHORTNOSE	2261	FISH	1
SCREVEN	L	STURGEON, SHORTNOSE	1438	FISH	1
TOOMBS	L	STURGEON, SHORTNOSE	127	FISH	1
WAYNE	L	STURGEON, SHORTNOSE	965	FISH	1
** Subtotal **			14982		6
** STATE: LA					
CONCORDIA	L	STURGEON, PALLID	13666	FISH	1
EAST CARROLL	L	STURGEON, PALLID	49241	FISH	1
MADISON	L	STURGEON, PALLID	30384	FISH	1
RAPIDES	L	PEARLSHELL, LOUISIANA	20790	CLAM	1
TENSAS	L	STURGEON, PALLID	60325	FISH	1
** Subtotal **			174406		5
** STATE: MO					
BUTLER	L	PEARLY MUSSEL, CURTIS'	1381	CLAM	1
BUTLER	L	PEARLY MUSSEL, PINK MUCKET	1381	CLAM	1
DUNKLIN	L	MUSSEL, FAT POCKETBOOK	92466	CLAM	1
NEW MADRID	L	STURGEON, PALLID	48260	FISH	1
PEMISCOT	L	STURGEON, PALLID	40280	FISH	1
SCOTT	L	STURGEON, PALLID	4706	FISH	1
STODDARD	L	PEARLY MUSSEL, PINK MUCKET	9711	CLAM	1
** Subtotal **			198185		7
** STATE: MS					
ADAMS	L	STURGEON, PALLID	2806	FISH	1
BOLIVAR	L	STURGEON, PALLID	47746	FISH	1
CLAIBORNE	L	DARTER, BAYOU	1060	FISH	1
CLAIBORNE	L	STURGEON, PALLID	1060	FISH	1
COAHOMA	L	STURGEON, PALLID	64064	FISH	1
COPIAH	L	DARTER, BAYOU	1246	FISH	1
COPIAH	L	STURGEON, GULF	1246	FISH	1
DE SOTO	L	STURGEON, PALLID	13309	FISH	1
HINDS	L	DARTER, BAYOU	11498	FISH	1
HINDS	L	STURGEON, GULF	11498	FISH	1

ENDANGERED SPECIES OCCURRING IN COUNTIE
WHERE COTTON IS GROWN WITHIN GROUPS
ARACHNID, CLAM, FISH, AND INSECT

COUNTY	STATUS	SPECIES	COTTON ACREAGE	GROUP	COUNT
ISSAQUENA	L	STURGEON, PALLID	16042	FISH	1
ITAWAMBA	L	MUSSEL, CURTUS'	4820	CLAM	1
ITAWAMBA	L	MUSSEL, JUDGE TAIT'S	4820	CLAM	1
ITAWAMBA	L	MUSSEL, PENITENT	4820	CLAM	1
LOWNDES	L	MUSSEL, JUDGE TAIT'S	0	CLAM	1
LOWNDES	L	MUSSEL, MARSHALL'S	4848	CLAM	1
LOWNDES		MUSSEL, PENITENT SHELL	0	CLAM	1
MONROE	L	MUSSEL, CURTUS'	9917	CLAM	1
MONROE	L	MUSSEL, JUDGE TAIT'S	9917	CLAM	1
MONROE	L	MUSSEL, PENITENT	9917	CLAM	1
RANKIN	L	STURGEON, GULF	6992	FISH	1
TUNICA	L	STURGEON, PALLID	30421	FISH	1
WASHINGTON	L	STURGEON, PALLID	66030	FISH	1
** Subtotal **			324077		23
** STATE: NC					
BERTIE	L	STURGEON, SHORTNOSE	1971	FISH	1
CHOWAN	L	STURGEON, SHORTNOSE	4527	FISH	1
EDGECOMBE	L	SPINYMUSSEL, TAR RIVER	8348	CLAM	1
HARNETT	L	SHINER, CAPE FEAR	1897	FISH	1
JOHNSTON	L	MUSSEL, DWARF WEDGE	822	CLAM	1
MARTIN	L	STURGEON, SHORTNOSE	1201	FISH	1
NASH	L	SPINYMUSSEL, TAR RIVER	3074	CLAM	1
PERQUIMANS	L	STURGEON, SHORTNOSE	2176	FISH	1
PITT	L	SPINYMUSSEL, TAR RIVER	2212	CLAM	1
WASHINGTON	L	STURGEON, SHORTNOSE	458	FISH	1
** Subtotal **			26686		10
** STATE: NM					
CHAVES	L	GAMBUSIA, PECOS	12062	FISH	1
CHAVES	L	SHINER, PECOS BLUNTNOSE	12062	FISH	1
EDDY	L	GAMBUSIA, PECOS	8990	FISH	1
EDDY	L	SHINER, PECOS BLUNTNOSE	8990	FISH	1
HIDALGO	L	TROUT, GILA	5723	FISH	1
LUNA	L	SHINER, BEAUTIFUL	9567	FISH	1
** Subtotal **			57394		6
** STATE: SC					
ALLENDALE	L	STURGEON, SHORTNOSE	2101	FISH	1
CLARENDON	L	STURGEON, SHORTNOSE	5181	FISH	1
COLLETON	L	STURGEON, SHORTNOSE	264	FISH	1

ENDANGERED SPECIES OCCURRING IN COUNTIE
WHERE COTTON IS GROWN WITHIN GROUPS
ARACHNID, CLAM, FISH, AND INSECT

COUNTY	STATUS	SPECIES	COTTON ACREAGE	GROUP	COUNT
WILLIAMSBURG	L	STURGEON, SHORTNOSE	1963	FISH	1
** Subtotal **			9509		4
** STATE: TN					
DYER	L	STURGEON, PALLID	13044	FISH	1
LAKE	L	STURGEON, PALLID	4822	FISH	1
LAUDERDALE	L	STURGEON, PALLID	21599	FISH	1
LAWRENCE	L	DARTER, SLACKWATER	198	FISH	1
LINCOLN	L	DARTER, BOULDER	2674	FISH	1
LINCOLN	L	DARTER, SNAIL	2674	FISH	1
LINCOLN	L	PEARLY MUSSEL, BIRDWING	2674	CLAM	1
LINCOLN	L	PEARLY MUSSEL, CRACKING	2674	CLAM	1
LINCOLN	L	PEARLY MUSSEL, CUMBERLAND MONKEYFACE	2674	CLAM	1
LINCOLN	L	PEARLY MUSSEL, FINE-RAYED PIGTOE	2674	CLAM	1
LINCOLN	L	PEARLY MUSSEL, SHINY PIGTOE	2674	CLAM	1
RUTHERFORD	L	RIFFLE SHELL, TAN	1614	CLAM	1
SHELBY	L	STURGEON, PALLID	18156	FISH	1
TIPTON	L	STURGEON, PALLID	41953	FISH	1
** Subtotal **			120104		14
** STATE: TX					
CALDWELL	L	DARTER, FOUNTAIN	4260	FISH	1
REEVES	L	GAMBUSIA, PECOS	7099	FISH	1
REEVES	L	PUPFISH, COMANCHE SPRINGS	7099	FISH	1
TRAVIS	L	BEETLE, KRETSCHMARR CAVE MOLD	5184	INSECT	1
TRAVIS	L	BEETLE, TOOTH CAVE GROUND	5184	INSECT	1
TRAVIS	L	HARVESTMAN, BEE CREEK CAVE	5184	ARACHNID	1
TRAVIS	L	PSEUDOSCORPION, TOOTH CAVE	5184	ARACHNID	1
TRAVIS	L	SPIDER, TOOTH CAVE	5184	ARACHNID	1
WILLIAMSON	L	BEETLE, KRETSCHMARR CAVE MOLD	42787	INSECT	1
WILLIAMSON	L	BEETLE, TOOTH CAVE GROUND	42787	INSECT	1
WILLIAMSON	L	HARVESTMAN, BEE CREEK CAVE	42787	ARACHNID	1
WILLIAMSON	L	PSEUDOSCORPION, TOOTH CAVE	42787	ARACHNID	1
WILLIAMSON	L	SPIDER, TOOTH CAVE	42787	ARACHNID	1
** Subtotal **			258313		13
** STATE: UT					
DAGGETT	L	SQUAWFISH, COLORADO	25743	FISH	1

ENDANGERED SPECIES OCCURRING IN COUNTIE
WHERE COTTON IS GROWN WITHIN GROUPS
ARACHNID, CLAM, FISH, AND INSECT

COUNTY	STATUS	SPECIES	COTTON ACREAGE	GROUP	COUNT
** Subtotal **					
			25743		1
** STATE: VA					
GREENSVILLE	P	LOGPERCH, ROANOKE	1558	FISH	1
** Subtotal **					
			1558		1
*** Total ***					
			5314385		201